

Syrian Arab Republic

Ministry of Education and Higher Education

Arab University for Science and Technology

Faculty of Computer Engineering



First Lecture

Modeling & Simulation

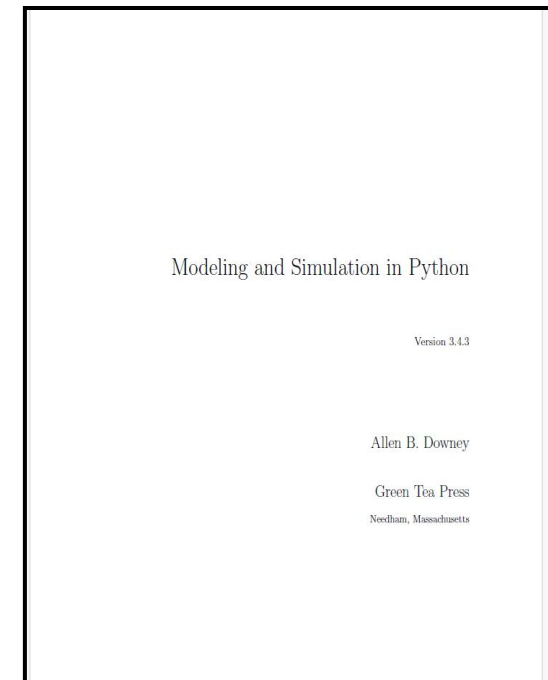
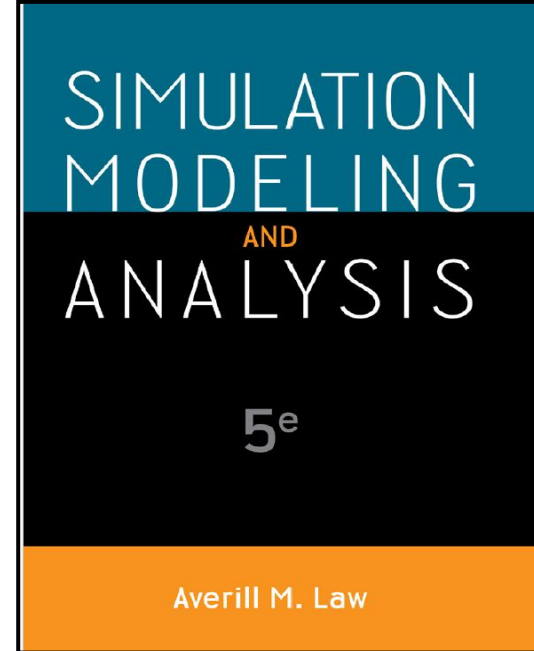
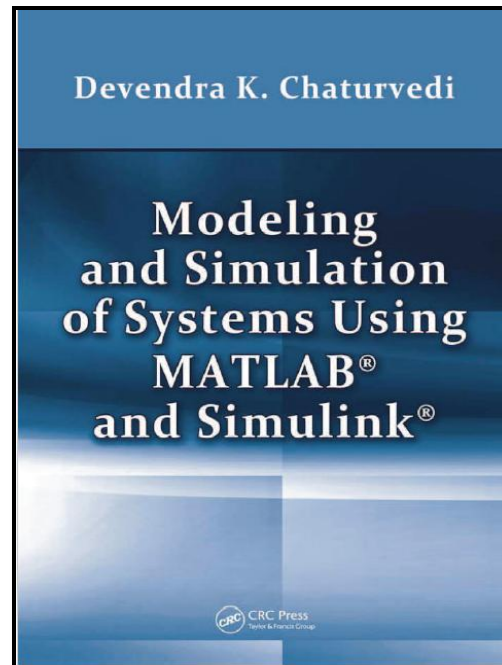
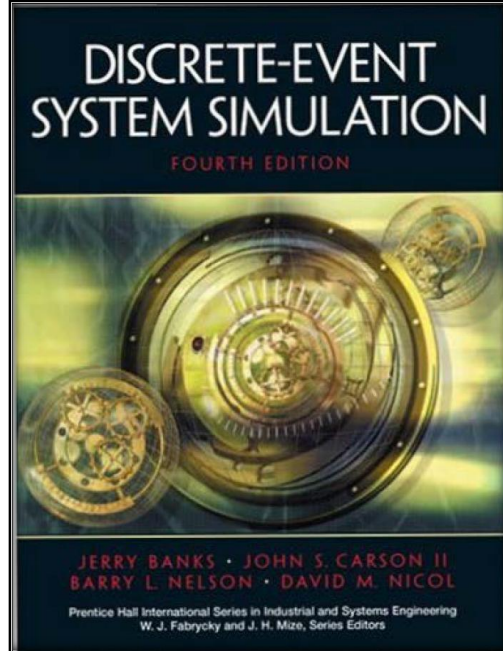
Lecturer Introduction

Dr. Radwan Sobhi Al-Mohammad

Agenda

- **General Introduction to the Reference.**
- **Modeling & Simulation.**
- **Concepts.**
- **Examples of modeling and simulation.**
- **Concept of a system and its components.**
- **System Classifications.**
- **Main Steps of Modeling and Simulation Process.**

1- General Introduction to the Reference :



2- Modeling & Simulation:

Modeling

The process of representing a system using a specific tool for the purpose of studying its behavior.

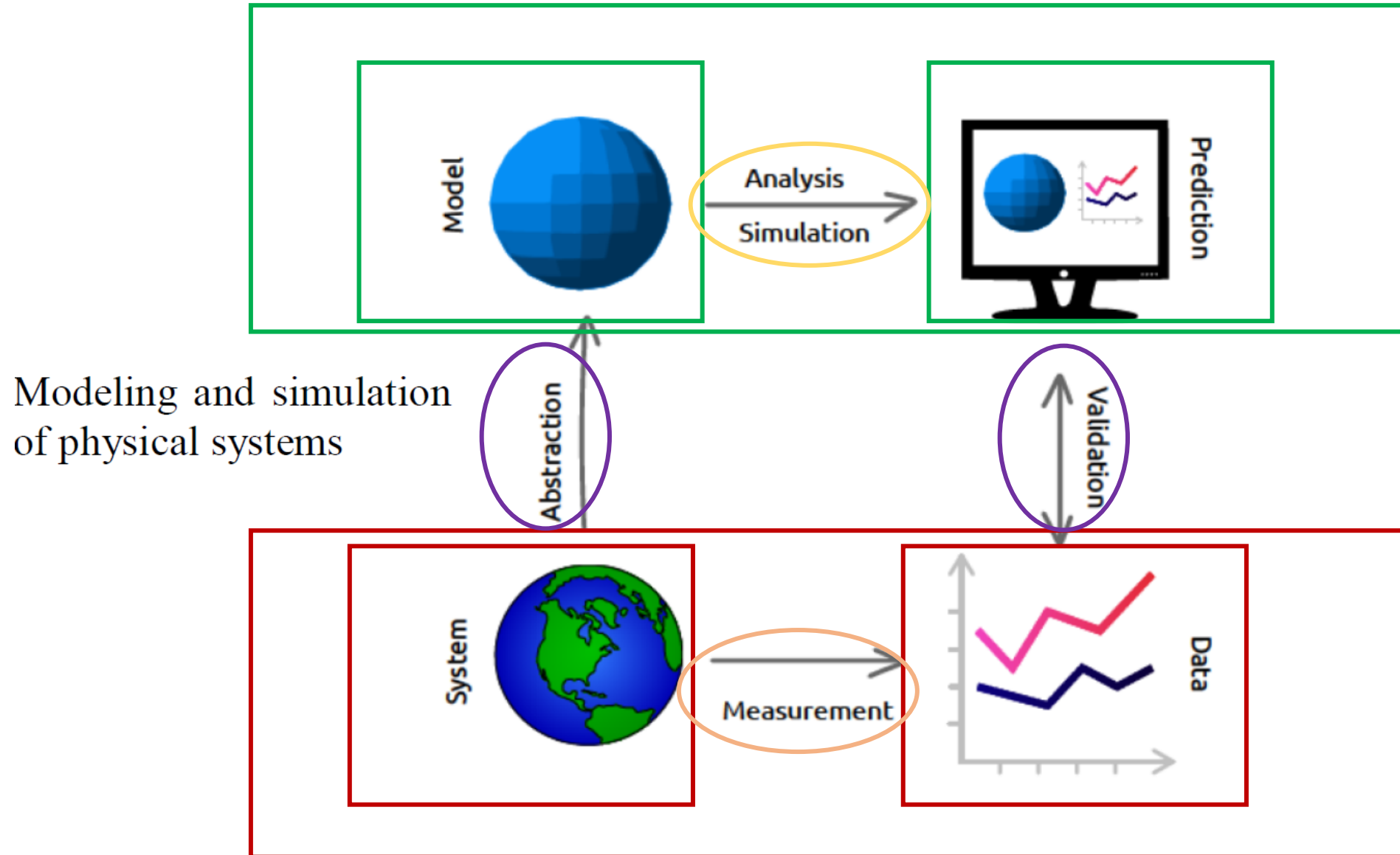
Simulation

The imitation of the operation of a real-world process or system over time.

Relationship between them:

1. Modeling precedes simulation: nothing can be simulated unless it has first been modeled.
2. The model is the “description,” and simulation is the “experimental execution” of that description.
3. The quality of simulation results depends directly on the accuracy of the model.

3- Concepts:



3- Concepts:

Model

The outcome of abstraction, comprising the features we consider essential.

Prediction

The outcomes of simulations that indicate what the system will do to achieve a specified objective.

System

Something in the real world that concerns us. It is often complex; therefore, we must decide which details can be simplified.

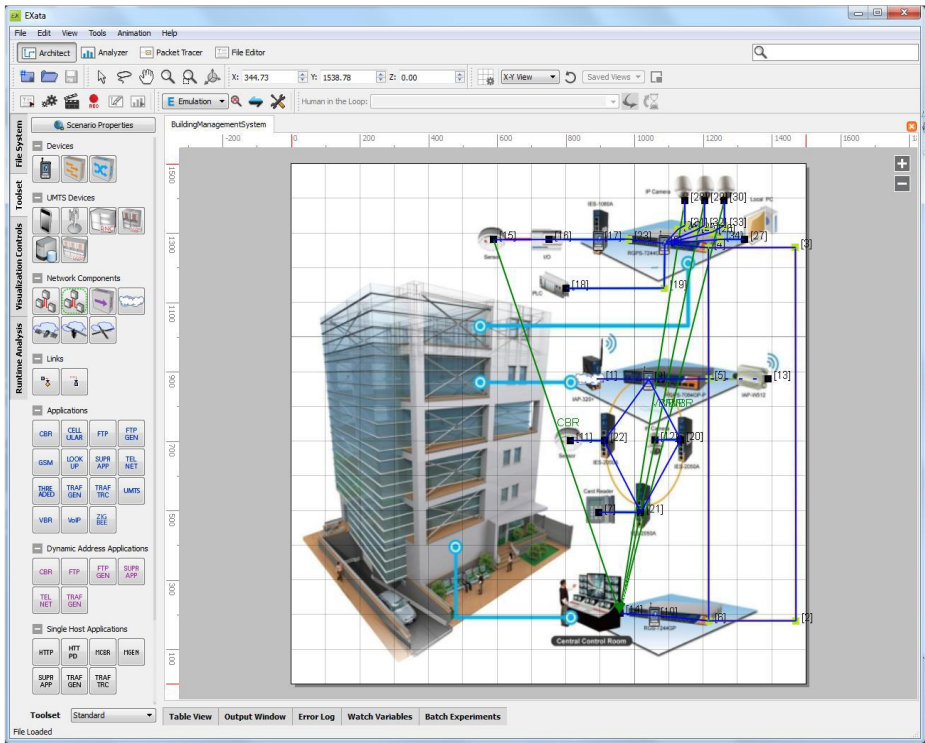
Abstraction

A process aimed at isolating the essential features of system, while disregarding details that are unnecessary for the purpose of analysis

Validation

The process of verifying the accuracy of predictions and testing designs by conducting measurements from the real world and comparing with the outcomes of simulation.

4- Examples of modeling and simulation:

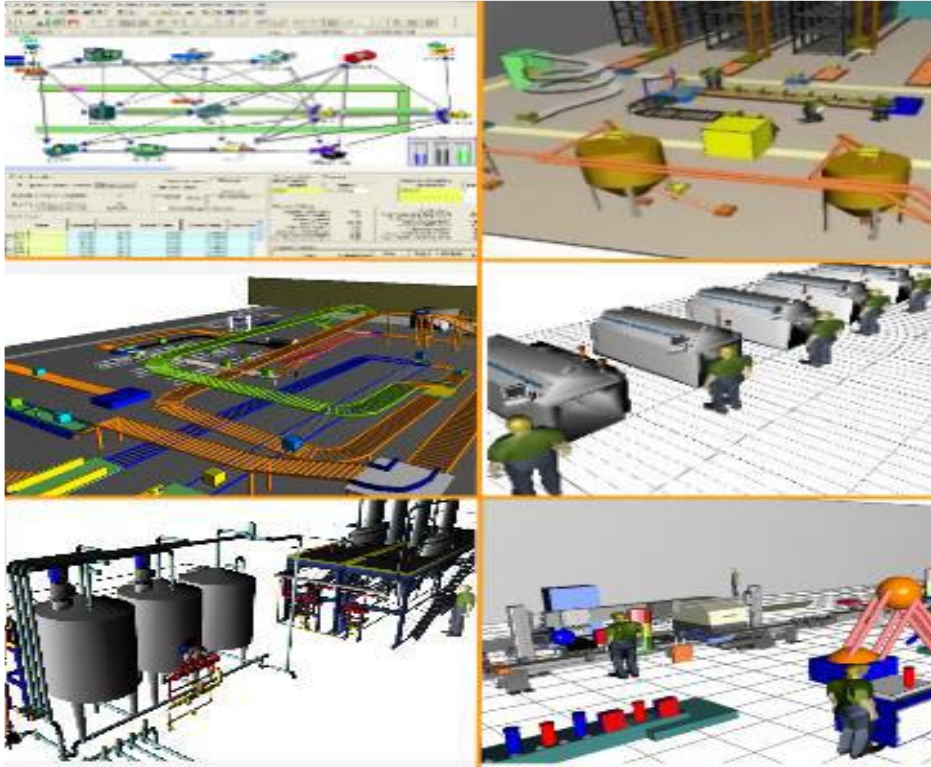


computer networks

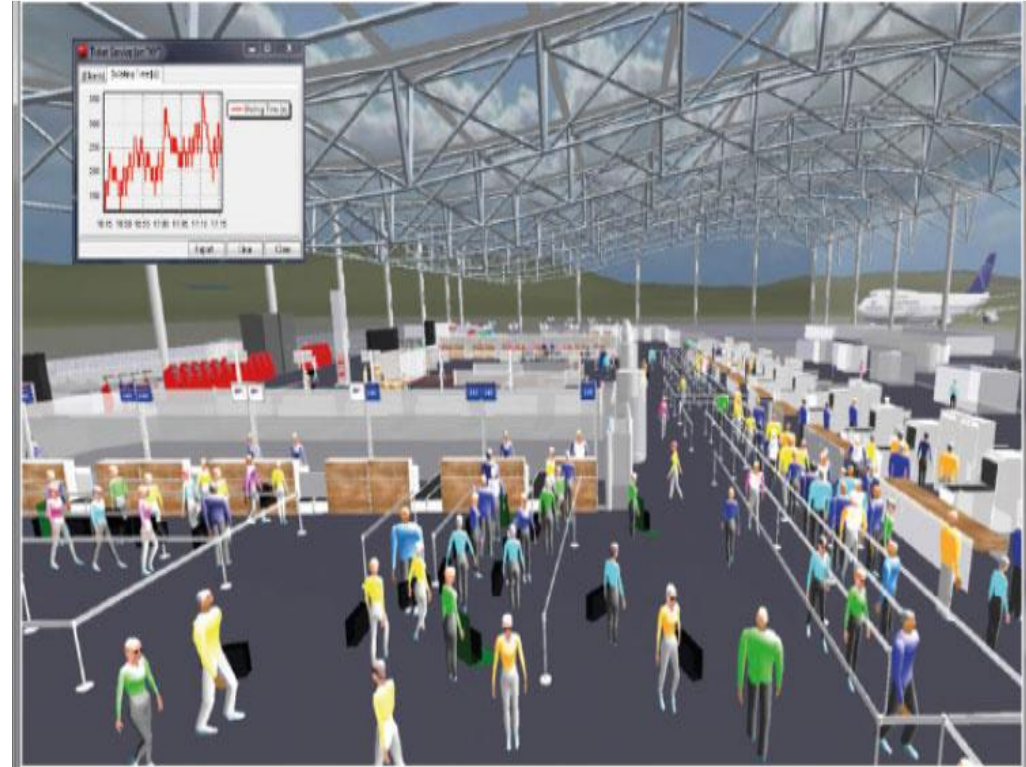


Military applications

4- Examples of modeling and simulation:

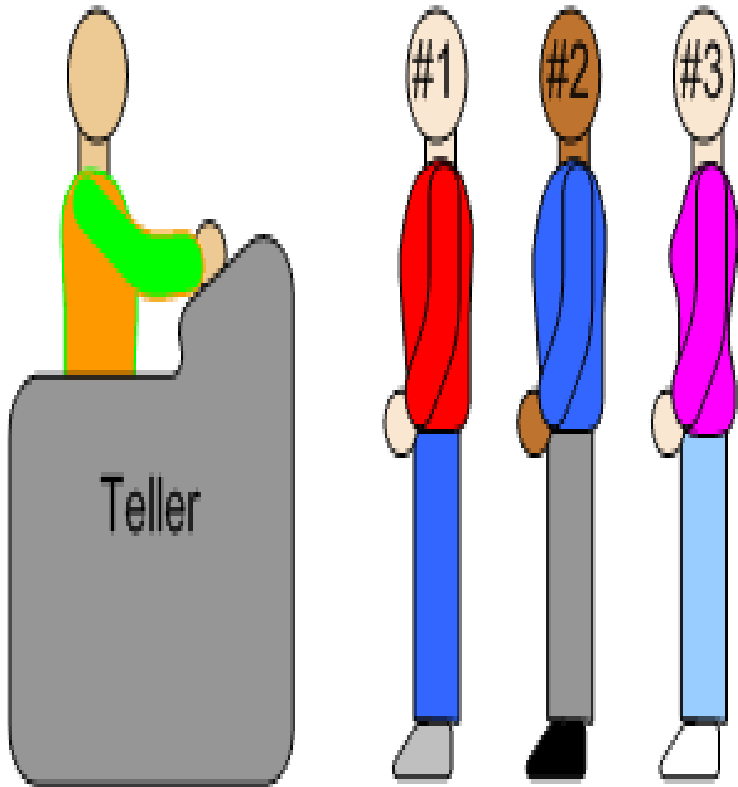


Production lines in factories



Airports

4- Examples of modeling and simulation:



Banks



Highways

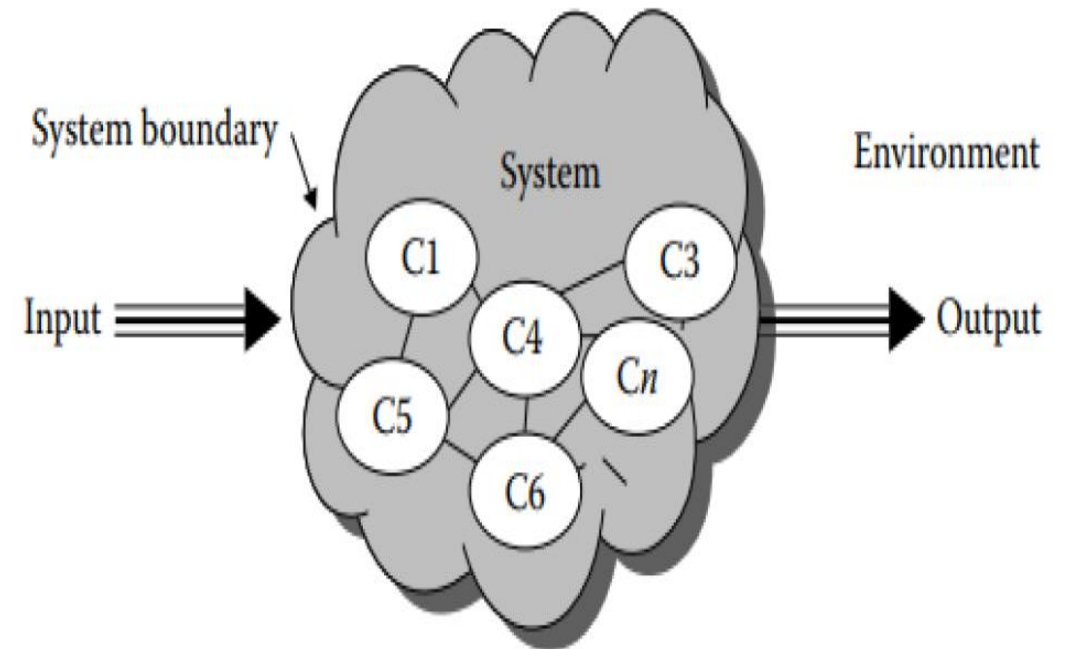
5- Concept of a system and its components:

Definition of a system:

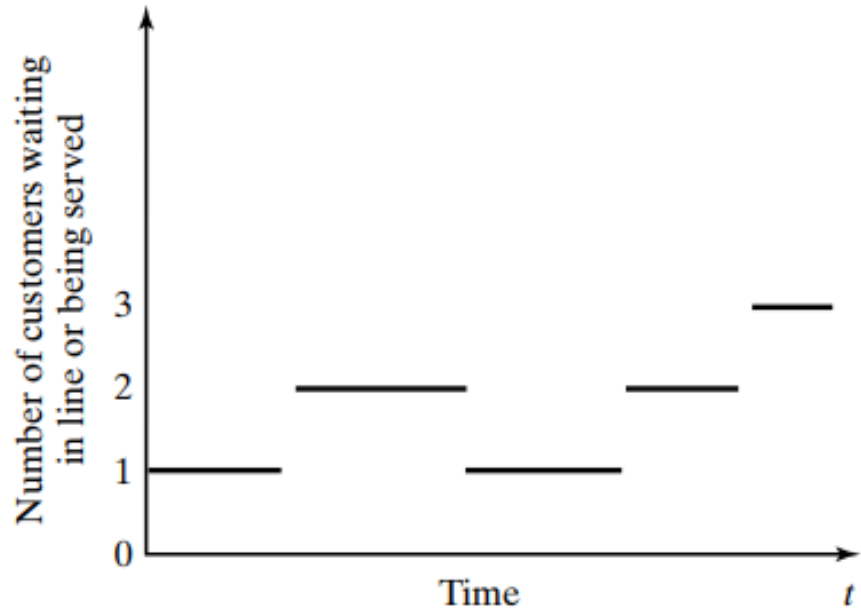
A term derived from the Greek word “systema,” meaning an organized relationship. It refers to any set of interrelated components that work together to achieve a common goal.

Components of a system:

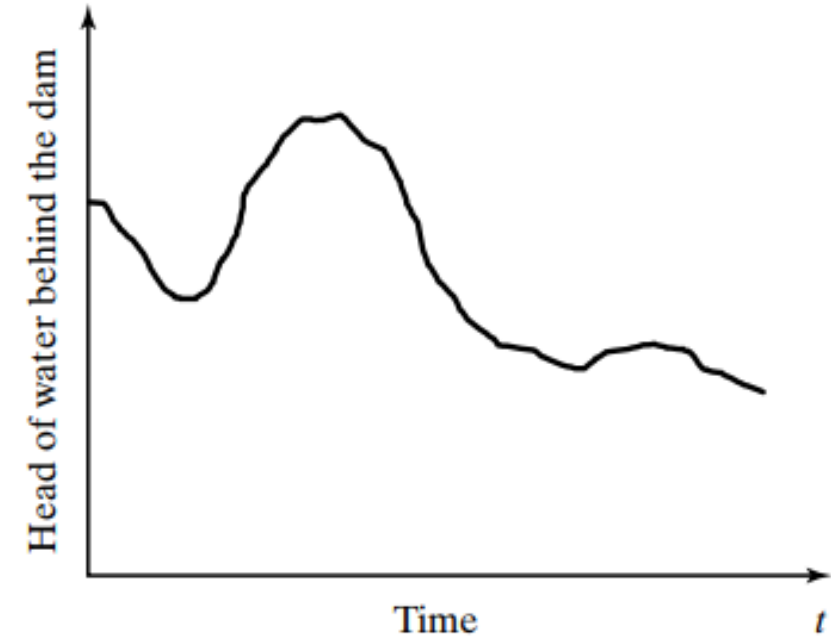
- 1) System elements and the relationships among them.
- 2) System boundaries.
- 3) The environment surrounding the system.



6- System Classifications:



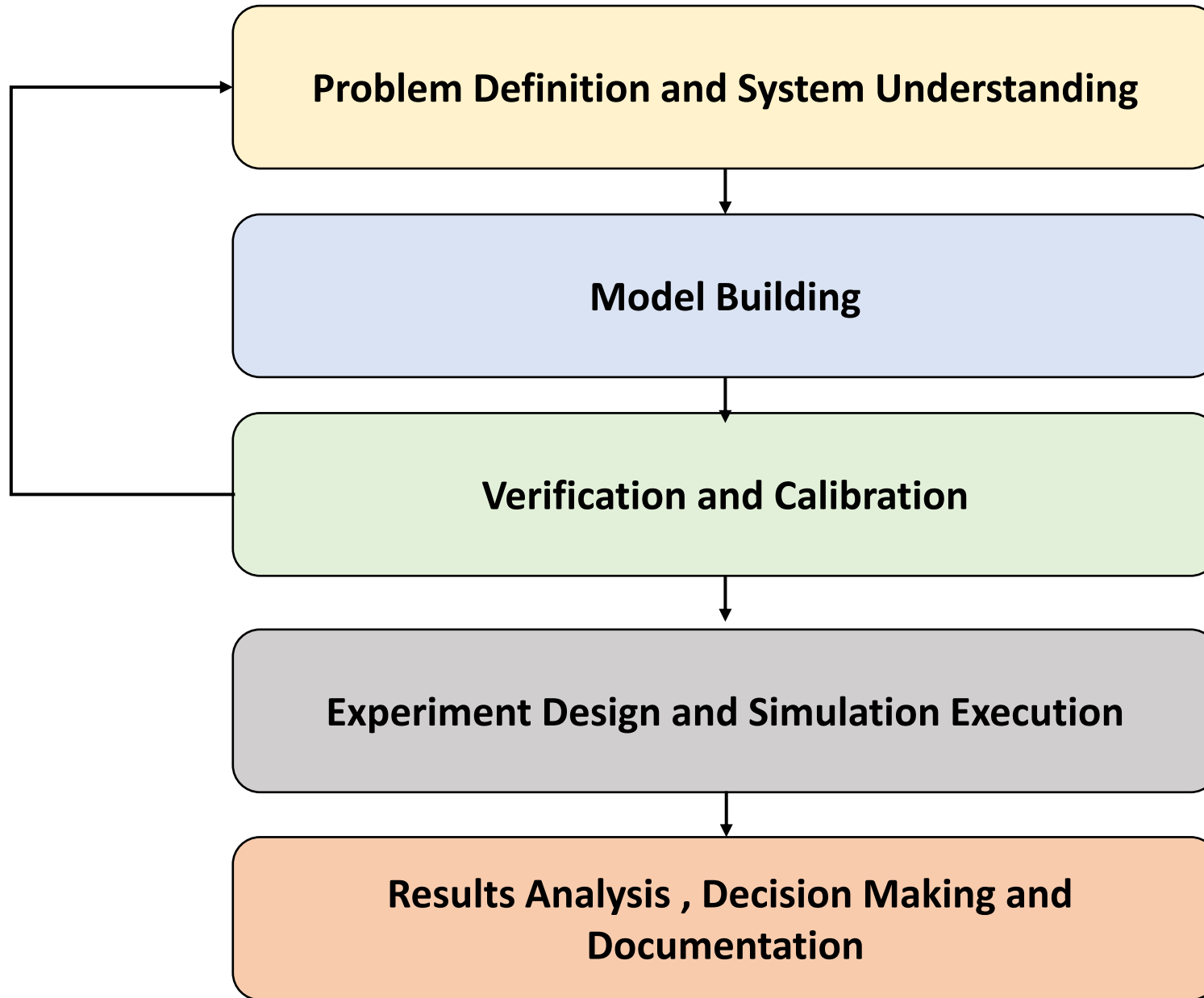
1- Discrete system: State variables change only at discrete points in time; for example, queuing systems.



2- Continuous system: State variables change continuously over time. Examples include the water level behind a dam.

3- Hybrid system: A combination of continuous and discrete dynamic behaviors, such as traffic flow on a road controlled by traffic lights.

7- Main Steps of Modeling and Simulation Process:



Thank you for listening